

CLAIMS

I/We claim:

- [c1] 1. A system of multi-channel shared resistor-string digital-to-analog converters (DACs) comprising:
- a multi-channel shared resistor-string digital-to-analog converters for converting multi-channel digital audio input to a multi-channel analog audio output; and
 - a plurality of high-order low-pass filters for attenuating the residue images of out-of-band noise in said multi-channel analog audio output, thereby reconstructing said multi-channel analog audio output.
- [c2] 2. The system of Claim 1, wherein said multi-channel analog audio signal output includes a multi-channel analog staircase waveform outputs, and said plurality of high-order low-pass filters includes plurality of high-order RC filters.
- [c3] 3. The system of Claim 1, wherein said multi-channel shared resistor-string digital-to-analog converters comprises:
- a shared resistor string for providing voltage levels of each channel demand;
 - a plurality of decoders for receiving a M bits modulated digital input signal and then outputting 2^M digital signal;
 - a plurality of switches connected to said shared resistor string and said plurality of decoders; and
 - a plurality of buffers for outputting said selected voltage levels;
- wherein each of said plurality of switches corresponds to one voltage level of said shared resistor string, and only one of said 2^M digital signal turning on one of said corresponding switch and outputting signal.

- [c4] 4. The system of Claim 3, wherein said switch includes MOS or CMOS.
- [c5] 5. A system of multi-channel shared resistor-string digital-to-analog converters, comprising:
- an interpolator for converting a multi-channel digital audio input at a sample rate into a multi-channel digital audio output with R multiples of said input sample rate;
 - a multi-channel shared resistor-string digital-to-analog converters for converting multi-channel digital audio input to a multi-channel analog audio output; and
 - a plurality of high-order low-pass filters for attenuating the residue images of out-of-band noise in said multi-channel analog audio output, thereby reconstructing said multi-channel analog audio output.
- [c6] 6. The system of Claim 5, wherein said interpolator is a time-sharing interpolator, and said multi-channel analog audio signal output is a multi-channel analog staircase waveform outputs, and said plurality of low-order low-pass filters are plurality of first order RC filters.
- [c7] 7. The system of Claim 5, wherein said multi-channel shared resistor-string digital-to-analog converters comprises:
- a shared resistor string for providing voltage levels of each channel demand;
 - a plurality of decoders for receiving a M bits modulated digital input signal and then outputting 2^M digital signal;
 - a plurality of switches connected to said shared resistor string and said plurality of decoders; and
 - a plurality of buffers for outputting said selected voltage levels;

wherein each of said plurality of switches corresponds to one voltage level of said shared resistor string, and only one of said 2^M digital signal turning on one of said corresponding switch and outputting signal.

[c8] 8. The system of Claim 7, wherein said switch is MOS or CMOS.

[c9] 9. A system of multi-channel shared resistor-string digital-to-analog converters, comprising:

a time-sharing interpolator for converting a multi-channel digital audio input at some sample rate into a multi-channel digital audio output with R multiples of said input sample rate;

a multi-channel shared resistor-string digital-to-analog converters for converting said multi-channel digital audio output to a multi-channel analog audio output; and

a plurality of low-order lowpass filters for attenuating the residue images of out-of-band noise in said multi-channel analog audio signal to complete said multi-channel analog audio signal reconstruction output.

[c10] 10. The system of Claim 9, wherein said multi-channel analog audio signal output is a multi-channel analog staircase waveform outputs, and said plurality of low-order lowpass filters are plurality of first order RC filters.

[c11] 11. The system of Claim 9, wherein said multi-channel shared resistor-string digital-to-analog converters comprises:

a shared resistor string for providing voltage levels of each channel demand;

a plurality of decoders for receiving a M bits modulated digital input signal and then outputting 2^M digital signal;

a plurality of switches connected to said shared resistor string and said plurality of decoders; and
a plurality of buffers for outputting said selected voltage levels;
wherein each of said plurality of switches corresponds to one said voltage level of said shared resistor string, and one of said 2^M digital signal turning on one of said corresponding switch and then outputting the signal.

[c12] 12. The system of Claim 11, wherein said switch is MOS or CMOS.

[c13] 13. A system of multi-channel shared resistor-string digital-to-analog converters, comprising:

an interpolator for converting a multi-channel digital audio input at a sample rate into a multi-channel digital audio output with R multiples of said input sample rate;

a modulator for modulating said multi-channel digital audio output to be a multi-channel digital audio output with a shorter sample wordlength and high-pass quantization noise;

a multi-channel shared resistor-string digital-to-analog converters for converting said multi-channel digital audio output to a multi-channel analog audio output; and

a plurality of filters for attenuating the residue images of out-of-band noise in said multi-channel analog audio to complete said multi-channel analog audio reconstruction output.

[c14] 14. The system of Claim 13, wherein said interpolator is a time-sharing interpolator, said modulator is a time-sharing sigma-delta modulator, said multi-channel analog audio output is a multi-channel analog staircase waveform outputs, and said plurality of filters are plurality of first order RC filters.

[c15] 15. The system of Claim 13, wherein said multi-channel shared resistor-string digital-to-analog converters comprises:

- a shared resistor string for providing voltage levels of each channel demand;
- a plurality of decoders for receiving a M bits modulated digital input signal and then outputting 2^M digital signal;
- a plurality of switches connected to said shared resistor string and said plurality of decoders; and
- a plurality of buffers for outputting said selected voltage levels;

wherein each of said plurality of switches corresponds to one said voltage level of said shared resistor string, and of one said 2^M digital signal turning on one of said corresponding switch, then outputting the signal.

[c16] 16. A system of multi-channel shared resistor-string digital-to-analog converters, comprising:

- a time-sharing interpolator for converting a multi-channel digital audio input at a sample rate into a multi-channel digital audio output with R multiples of said input sample rate;
- a time-sharing sigma-delta modulator for modulating said multi-channel digital audio output to be a multi-channel digital audio output with a shorter sample wordlength and high-pass quantization noise;
- a multi-channel shared resistor-string digital-to-analog converters for converting said multi-channel digital audio output to a multi-channel analog audio output; and
- a plurality of first order low-pass filters for attenuating the residue images of out-of-band noise in said multi-channel analog audio to complete said multi-channel analog audio reconstruction output.

[c17] 17. The system of Claim 16, wherein said multi-channel analog audio output is a multi-channel analog staircase waveform outputs.

[c18] 18. The system of Claim 16, wherein said multi-channel shared resistor-string digital-to-analog converters comprises:

- a shared resistor string for providing voltage levels of each channel demand;
- a plurality of decoders for receiving a M bits modulated digital input signal and then outputting 2^M digital signal;
- a plurality of switches connected to said shared resistor string and said plurality of decoders; and
- a plurality of buffers for outputting said selected voltage levels;

wherein each of said plurality of switches corresponds to one of said voltage level of said shared resistor string, and one of said 2^M digital signal turning on one said corresponding switch, then outputting the signal.

[c19] 19. The system of Claim 18, wherein said switch is MOS or CMOS.

[c20] 20. An output method of multi-channel shared resistor-string digital-to-analog converters, comprising:

- converting a multi-channel digital audio input at a sample rate into a multi-channel digital audio output with R multiples of said input sample rate by an interpolator;
- modulating said multi-channel digital audio output to be a multi-channel digital audio output with a shorter sample wordlength and high-pass quantization noise;
- transforming said multi-channel digital audio output to a multi-channel analog audio output by using a multi-channel shared resistor-string digital-to-analog converters to; and
- attenuating the residue images of out-of-band noise in said multi-channel analog audio to complete said multi-channel analog audio reconstruction output.

[c21] 21. The output method of Claim 20, wherein said interpolator is a time-sharing interpolator, said modulator is a time-sharing sigma-delta modulator, said multi-channel analog audio output is a multi-channel analog staircase waveform outputs, and said plurality of filters are plurality of first order RC filters.

[c22] 22. The output method of Claim 20, wherein said multi-channel shared resistor-string digital-to-analog converters comprises:

- a shared resistor string for providing voltage levels of each channel demand;

- a plurality of decoders for receiving a M bits modulated digital input signal and then outputting 2^M digital signal;

- a plurality of switches connected to said shared resistor string and said plurality of decoders; and

- a plurality of buffers for outputting said selected voltage levels;

wherein each of said plurality of switches corresponds to one said voltage level of said shared resistor string, and one of said 2^M digital signal turning on one of said corresponding switch, then outputting the signal.

[c23] 23. The output method of Claim 22, wherein said switch is MOS or CMOS.

[c24] 24. An output method of multi-channel shared resistor-string digital-to-analog converters, comprising:

- using an interpolator to convert a multi-channel digital audio input at some sample rate into a multi-channel digital audio output with R multiples of said input sample rate;

- using a multi-channel shared resistor-string digital-to-analog converters to convert said multi-channel digital audio output to a multi-channel analog audio output; and

using a plurality of low-order low-pass filters to attenuate the residue images of out-of-band noise in said multi-channel analog audio to complete said multi-channel analog audio reconstruction output.

[c25] 25. The output method of Claim 24, wherein said interpolator is a time-sharing interpolator, said multi-channel analog audio output is a multi-channel analog staircase waveform outputs, and said plurality of low-order low-pass filters are plurality of first order RC filters.

[c26] 26. The output method of Claim 24, wherein said multi-channel shared resistor-string digital-to-analog converters comprises:

- a shared resistor string for providing voltage levels of each channel demand;

- a plurality of decoders for receiving a M bits modulated digital input signal and then outputting 2^M digital signal;

- a plurality of switches connected to said shared resistor string and said plurality of decoders; and

- a plurality of buffers for outputting said selected voltage levels;

wherein each of said plurality of switches corresponds to one said voltage level of said shared resistor string, and one of said 2^M digital signal turning on one of said corresponding switch and outputting the signal.

[c27] 27. The system of Claim 26, wherein said switch MOS or CMOS.

[c28] 28. An output method of multi-channel shared resistor-string digital-to-analog converters, comprising:

- using a multi-channel shared resistor-string digital-to-analog converters to convert said multi-channel digital audio input to a multi-channel analog audio output; and

using a plurality of high-order low-pass filters to attenuate the residue images of out-of-band noise in said multi-channel analog audio to complete said multi-channel analog audio reconstruction output.

[c29] 29. The output method of Claim 28, wherein said interpolator is a time-sharing interpolator, said multi-channel analog audio signal output is a multi-channel analog staircase waveform outputs, and said plurality of high-order low-pass filters are plurality of high-order RC filters.

[c30] 30. The output method of Claim 28, wherein said multi-channel shared resistor-string digital-to-analog converters comprises:

- a shared resistor string for providing voltage levels of each channel demand;
- a plurality of decoders for receiving a M bits modulated digital input signal and then outputting 2^M digital signal;
- a plurality of switches connected to said shared resistor string and said plurality of decoders; and
- a plurality of buffers for outputting said selected voltage levels;

wherein each of said plurality of switches corresponds to one said voltage level of said shared resistor string, and one of said 2^M digital signal turning on one of said corresponding switch, then outputting the signal.

[c31] 31. The system of Claim 30, wherein said switch is MOS or CMOS.